ventilation is required; all of which are ultimately united with the grand arterial conduits.

Some description of other arrangements at Osmaston Manor may prove interesting:—

The coal-yard is placed in the centre of the stable and kitchen courts: it is, however, passed without notice in consequence of its being several feet below the court, on the same level as the passage leading to the stokery, and communicating with the brewhouse and cellars. On the inclined floor of this passage a tramway is laid, with turning-tables at the angles. The trucks running on this way convey wine and malt liquor into the cellars, and by means of a hydraulic lift connected with it, coals or heavy goods are raised to the bed-room floors, without the slightest interference with the staircases in the house. The principal lift rises to the height of 40 feet from the cellar floor, and has a well or cylinder of the same depth below, in which the plunger works: the machine is put in action by the introduction of water at the bottom, which, by its pressure, forces the piston upwards. There is another lift, connected with the scullery, for the use of the kitchen offices.

The boilers, attached to the heating apparatus, and supplying hot water to the baths and house generally, are fixed immediately under the brewhouse, and the pipeage from them is intended to heat the conservatory also, while a large plunge bath is rendered tepid from the same source.

The whole of the building is rendered fire-proof by the use of cast-iron girders, supporting brick arches, which form the floors and roofs. The upper surface of the roofs was first levelled with concrete: bricks were then laid at distances of two feet, forming a succession of gutters, with a sufficient fall to the cast-iron gutters. The whole was then floated over with Roman cement, and covered with thin sheet lead. The slates are one inch thick, polished on both sides, cut to a regular gauge and size by the workmen, and merely laid on the ridge part, without any other assistance to form the joint than the accuracy of the cutting. The surface is now remarkably level, and has not undergone the slightest change since the roofs were finished. I should not recommend the use of Roman cement immediately under lead, but I should prefer tiles, made so as to form the ridges and gutters, on which the lead might be dressed; as, where the surface of the lead is in contact with the cement, oxydation is found to be going on to a considerable extent, from which those parts which touch the brick only are perfectly free.

A considerable collateral advantage is obtained by the adoption of flat roofs, and the remote discharge of smoke. The portion of the offices occupied as larders and dairies, being covered in a similar manner to the principal part of the house, forms an excellent drying yard, accessible from the landing of the laundry stairs, and screened by perforated stone work, so as to be entirely out of sight, except from a high level.

The system of smoke conduction which I have described has now been in operation for two years, and, as far as regards the general principle, it must be pronounced quite successful. Mr. Wright assures me that smoky rooms are unknown in his house, and that the ventilation is perfect and most agreeable. The rapidity of the current is increased considerably when the wind is high, but there is at all times, even under the most unfavourable circumstances of density in the atmosphere, a free discharge of smoke and foul air. A genial warmth from the heating apparatus is always diffused throughout the passages, and in the remote corners of the rooms where the radiating influence of the fire cannot extend. The roofs are also perfectly accessible, and free from the slightest taint of soot or foul air.

It is not my intention to advocate the system for general use, as in numerous cases it could not be applied, and it is probable that the extra cost would, in the generality of practice, prove a barrier to its adoption. There is, moreover, no doubt that the situation of Osmaston is peculiarly favourable for the application of Sylvester's principle, built as the house is on hanging grounds, with a considerable elevation behind, by which the relative altitude of the great shaft is increased, and the discharge is obtained clear above all surrounding objects.

There are, however, few public buildings on a large scale in which the system might not be advantageously employed, and the lunatic asylum near Derby may be mentioned as an instance in which the result is found to be quite satisfactory, while the architectural difficulties have been surmounted in a very successful manner. The absolute necessity for a great height of shaft precludes its adoption in small houses, unless in ranges of combined dwellings. The removal of the ashes and soot being effected at the bottom of the flues, is a very important advantage, and when the latter are properly constructed, they rarely require sweeping. The distance of the shaft from the house, as at Osmaston, is not at all necessary, as there is no objection whatever to its being built in the centre, with the apartments grouped round it; in which case, a tower rising out of the mass would form, under skilful treatment, a highly picturesque feature, and under such circumstances, it would only be requisite to make the height of the smoke shaft as much above the highest fire-place as is requisite in ordinary cases to ensure draught, while the flues need not descend, but they might traverse the walls to the place of connexion with the vertical tunnel: of course, in such instances, due allowance must be made for loss of draught by friction, according to the distance which the smoke travels horizontally to the main shaft. Only a very slight space is required for the passage of smoke and vapour, when the fires have been lighted a short time in the grates at Osmaston: indeed, I have observed on several occasions that the opening of louvres at the back of the fire-place did not exceed one inch superficial.

Other objections may be raised to the application of the system besides its expense, such as the disagreeable appearance of a house without chimneys, and the discharge of a large body of smoky vapour from one shaft, instead of small quantities from numerous smaller ones: still these objections are only incentives to invention; and as the principle is right and philosophical, and has been proved by successful operation, we may expect that vases, balustrades, and statuary works will supply the place of chimneys, and that we shall soon learn to consume the carbon of the smoke, and to reduce it, as nearly as possible, to clear vapour.

In reply to numerous questions from members, Mr. Stevens said, that the expense incurred at Osmaston was much greater than it would have been if the house had been constructed with ordinary chimneys, but he did not think it could be taken as a fair example of the best mode of applying the system, which could be carried out in a cheaper manner. In the present instance it had cost about 5,000*l.* of the total sum of 50,000*l.* to 60,000*l.* which had been expended. The pure air shaft was used for the ventilation of the house generally, so that coolness in summer could be ensured as well as warmth in winter. The highest fire-place was 34 feet 6 inches above the floor line of the principal rooms, and the flues from all of them descended to the horizontal shaft, which was 8 feet square, and ended in the upcast shaft. The latter rose to the height of 150 feet above the highest fire-place. The chimney flues were formed of tiles, made in the form of a parallelogram, 14 inches by 10 inches, with the corners rounded off. That size was retained when the flues became horizontal, and when they entered the main shaft a space of 144 inches was allowed for each downward flue. He was of opinion, however, that there would be no danger, and certainly a saving of expense, if the vertical portion of the flue were made smaller to the extent of about one-fourth, which would allow a proportionate saving in the construction of the main shaft. There were flues in the external walls, but they were so built that it was hardly possible that they would be acted upon by the atmosphere. Alluding to the construction of the main upward shaft, he observed, that if all chimney flues were built and kept with an air-tight space around them, there would not be such frequent complaints of smoky chimneys. The fire in the grates at Osmaston was made upon a grating at the level of the floor, and the ashes fell through it into an ash pit, which could be cleared by drawing away the moveable hearth, or the ashes might be allowed to pass through the opening and to fall to the bottom of the flue. The draft being strong, and every part of the work fire-proof, there was no apprehension of their catching fire, in the event of any ignited soot finding its way to them. Unless there were a number of fires burning at one time, there might be some difficulty in maintaining the draught, if the fire was not constantly kept up at the bottom of the great shaft. The removal of the soot was provided for by the size of the flues, all of which were large enough to receive a man. He was informed that the application of this system to the Bath Gaol added 5 per cent. to the cost of the building. The draught was not prejudiced, but, on the contrary, rendered stronger, by the windows being opened; nor would the draught of the rooms having closed windows be affected by the windows in the other rooms being opened. The division of the horizontal main flue into two branches, at its entrance into the upright shaft, was occasioned by the position of the shaft with reference to the house; the latter facing to the south-east, whilst the former faced the four cardinal points. The inner circular shaft was of 9-inch brickwork, without iron bands, and, from a point indicated in the section, it stood entirely separate from the outer walls, to the very top. The stairs formed a spiral round the shaft, but the steps were not at all connected with it, nor did they even touch it: they were formed of plates of cast-iron, let into and supported by the outer wall.

The outer square casing was of brick and limestone; in the thinnest part about eight inches thick. With respect to the height and capacity of the up shaft, the general proportion was 144 inches for each flue that entered it, both horizontally and vertically; but he believed that proportion might be reduced. The height of the shaft must be regulated by the distance the smoke had to be drawn downwards, the friction increasing in an accelerating ratio in proportion to the height; but if there were fires on the ground floor only, a very low shaft would be sufficient. The shaft at Osmaston was five times the greatest height from which the smoke was drawn: he believed that it was higher than was necessary, but he was not able to lay down any rule, as it must depend on the locality. There was no advantage in placing the shaft so far from the building: Mr. Wright's wish was to convey the smoke entirely away from the house, and it was found that if the shaft had not been of a considerable height, in some states of the wind, the smoke would have been blown back again. At present, even in the worst winds, the shaft stood so free, that the draught was not at all affected, even in the farthest flues.

To an inquiry, how fresh air was introduced into the various apartments, Mr. Stevens replied that, in some instances the air was let in at the floor level, by gratings in the skirtings; but he intended, in the rooms about to be finished, to introduce it at the top. He believed that Mr. Silvester considered that mode preferable to the former, as the fresh air mixed better with that of the apartment, and persons were not so likely to feel the draught. The vitiated air would then escape at the chimney, which was in fact the ventilator. It was desirable to introduce the air in as large quantities as possible, so as to have much more than was required. The smaller the current, the greater was the sensation of draught.

To an inquiry, how the warm air was introduced into the rooms, and whether the downward shaft was provided with any machine to ensure a supply of fresh air, Mr. Stevens said that the down-shaft was provided with a turn-cap and vane, which had the effect of turning it to the wind, so that the passage of the air was always constant and unvarying. From that shaft the air passed along a duct to the

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